STUDIES IN CEREAL DISEASES

IX

LOSSES CAUSED BY DISEASES OF CEREALS IN WESTERN CANADA

DIVISION OF BOTANY
DOMINION EXPERIMENTAL FARMS

H. T. GÜSSOW
DOMINION BOTANIST

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE

PAMPHLET No 152—NEW SERIES

Published by direction of the Hon. Robert Weir, Minister of Agriculture
Ottawa, 1933

LOSSES CAUSED BY DISEASES OF CEREALS IN WESTERN CANADA

Agriculture is the primary industry in western Canada and is principally concerned with the production of cereal crops. All of the cereal crops now grown are subject to the attack of diseases caused by parasitic organisms, chiefly fungi. Some of these diseases affect the stem and leaves. The most important of these are the rusts. Others, the smuts, destroy the kernels. Still others attack the underground parts of the plants and are known as root-rots. Some idea of the destructiveness of these various diseases can be gained from a perusal of the following paragraphs.

LOSSES FROM RUSTS

Rusts attack a great variety of plants, but, owing to the extensive scale on which cereals are grown, the greatest economic losses from these diseases occur among cereal crops. The nature of the loss is two-fold: first, a direct loss in yield due to the reduction in size and number of kernels in the heads of the grain; and, second, reduction in quality due to the production of small shrunken kernels.

There are six important rusts of cereals. The most conspicuous and by far the most destructive of these is black stem rust. Stem rust usually attacks the culms and sheaths, while the others attack the leaves chiefly, and are collectively known as leaf rusts. The estimates in this paper deal mainly with the losses caused by stem rust, and are based on the results of experiments in which rusts were controlled by means of sulphur dust, and on acreage, yield, and price statistics.

LOSSES CAUSED BY DISEASES OF CEREALS IN WESTERN CANADA (LOSSES FROM RUSTS)

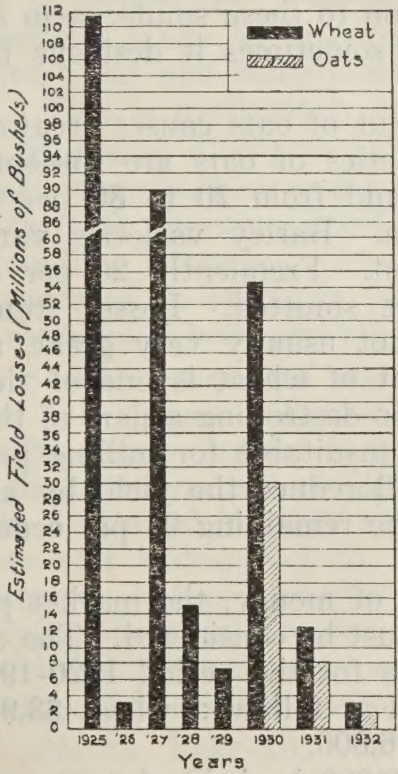

Figure 1. Estimated annual field losses from stem rust of wheat (1925-32) and of oats (1930-32) in Manitoba and Saskatchewan.

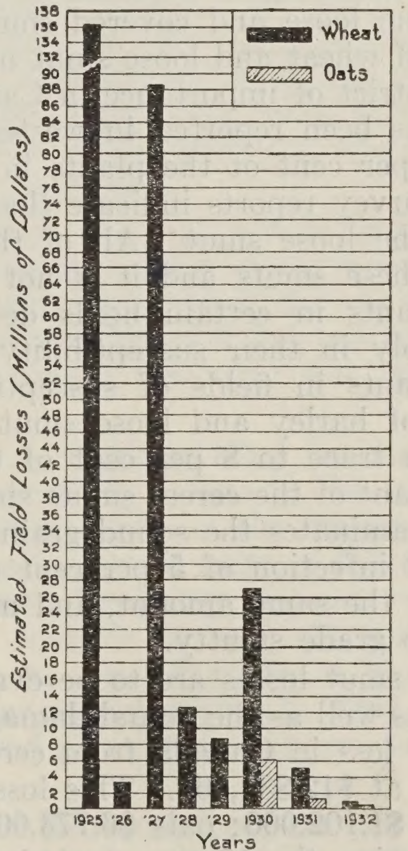

Figure 2. Estimated annual financial losses from stem rust of wheat (1925-32) and of oats (1930-32) in Manitoba and Saskatchewan.

The estimated annual losses from stem rust of wheat during the eight years, 1925 to 1932, and from oat stem rust in 1930, 1931, and 1932, in Manitoba and Saskatchewan are given in Figure 1. Annual financial losses for the same periods are given in Figure 2. In Alberta losses from stem rust are not so heavy as in the other two provinces. The average annual loss from stem rust of wheat and oats in Manitoba and Saskatchewan is given in Table 1.

TABLE 1—AVERAGE ANNUAL LOSS FROM STEM RUST OF WHEAT AND OATS IN MANITOBA AND SASKATCHEWAN

Period	Crop	Bushels	Dollars
1925-1932	Wheat	37,396,000	35,439,000
1930, 1931, 1932	Oats	13,525,000	2,624,000

In addition to direct losses in yield from rust there are losses due to reduction in grain quality. Market discounts due to loss in commercial grade may range from one cent to fifty cents per bushel, depending upon the amount of rust injury and the price of the grain. Taken together, the losses in yield and grade from stem rust of wheat and oats, even at moderate grain prices, amount to at least $40,000,000 annually in the three prairie provinces.

LOSSES FROM SMUTS

Smut diseases are responsible for heavy reductions in the yield and quality of Canadian cereal crops. Certain varieties of cereals remain, year after year, practically free from smut, whereas others are seriously affected. Local climatic conditions may also influence the severity of smut attack.

The loose and covered smuts of oats, loose and covered smuts of barley, bunt of wheat and loose smut of wheat are to be found in every cereal-producing district of importance in Canada. In addition to these smuts, stem smut of rye has been reported in western Canada, and sometimes it destroys from 15 to 20 per cent of the plants in some fields.

Survey reports indicate that the covered smut of oats causes greater losses than the loose smut. All of the standard varieties of oats are susceptible to both these smuts and it is not uncommon to find from 20 to 30 per cent of the plants in certain fields destroyed by them. Barley varieties vary considerably in their susceptibility to covered smut. Frequently 20 per cent of the plants in fields of susceptible varieties are smutted. Losses from loose smut of barley and loose smut of wheat are not usually very great, ranging from a trace to 8 per cent of the plants. Bunt of wheat is one of the most important of the cereal smuts since, in addition to destroying a part of the crop, it contaminates the sound grain and renders it unsuitable for milling purposes. A field infection of 5 per cent of the plants will reduce the yield by approximately the same amount, and may also cause the remaining 95 per cent of the crop to grade smutty.

If smut losses are to be evaluated in terms of money, the market price of grain as well as the actual damage to the crop must be considered. The average annual loss in Canada from cereal smut diseases for the period 1920-1923 was placed at $12,831,000. This loss was distributed as follows: wheat $3,980,000; barley $1,102,000; oats $6,773,000; and corn $976,000.

During the 12-year period 1920-1932, 20,000,000 bushels of western Canadian wheat were graded smutty. This represents a direct loss of approximately $2,000,000 due to reduction in grade alone.

LOSSES FROM ROOT-ROTS

The diseases which affect the roots and stem bases of wheat, oats, barley and rye are commonly referred to as root-rots. There are different types of root-rots; each has, however, its own peculiar characteristics, but all types enfeeble or sap the vitality of the plants. Occasionally plants are killed outright. Since roots are feeding organs, their healthy development and functioning determines the vigour of the plant or crop. For instance, plants use a great amount of water which must be obtained from the soil through the roots. It is quite clear, therefore, that if the roots are diseased, the crop is greatly handicapped and may sustain serious losses in respect to both quantity and quality. Some of the root-rots may cause the affected crop to be delayed in ripening thus exposing it to further injury and loss by rust or frost.

The root-rots occur every year throughout the entire grain-growing area of the three prairie provinces. The three most important types are commonly referred to as Take-all, Browning, and Common root-rot. Take-all and Browning root-rots are primarily diseases of wheat, whereas Common root-rot affects all cereals and grasses, as well as some other plants. The first two frequently appear in epidemics and cause serious reductions in yield and quality. Take-all is one of the most, if not the most, deadly of all root-rots. Although commonly evident in patches, this root-rot also attacks plants at random in the field. Affected plants are distinguished by a bleached and dead appearance, and the roots and lower part of the stems by a rotted and black condition. Browning root-rot is most readily determined during the seedling stage. The leaves of affected seedlings turn brownish while at the same time rotted areas will be found on the roots. This disease may appear in large patches, in entire fields, or over a whole district. It is usually most severe in the summer-fallow crop. Diseased plants are delayed in growth and become subject to rust and frost injury. Common root-rot, as the name suggests, is prevalent in varying amounts each year, causing from slight to severe damage. It may occur in patches when severe, but, in slight and moderate cases, the extent of injury is difficult to determine. Diseased plants reveal discoloured roots and crowns. This root-rot tends to increase where cereal production has been carried on year after year and consequently it is a problem which confronts the western farmer. This is particularly true in the older districts.

In Manitoba Common root-rot is widespread and well established. The old wheat lands harbour many of the fungous parasites which cause this disease. Losses through damage caused by this root-rot run into several millions of dollars annually. Browning root-rot is found in this province but has not in recent years appeared in epidemic form. Take-all is found here also, but very few severe cases have been observed.

In Saskatchewan the wheat crop is subject to infestations by the three types of this disease. Take-all root-rot is particularly severe in the northern areas. Browning root-rot is very severe in certain years on the Regina plains and in the southern part of the province in general. Severe cases of this disease, however, are found in other parts of the province. Browning root-rot was very injurious and widespread in 1928. Common root-rot is well established in Saskatchewan but is probably less severe than in some districts of Manitoba. In studying the available data over a three-year period ending in 1930, it was estimated that these three types of root-rot caused an average annual loss to the wheat crop of Saskatchewan of $6,500,000.

In Alberta, Take-all, Common root-rot and Browning root-rot are serious diseases. Take-all is particularly severe in the black soils which make up a large part of the cultivated area of the province. Common root-rot is prevalent and frequently severe. Considering these three types of root-rot it is safe to say

that the yield of practically all fields, including those apparently healthy, suffer in some degree. Ever since root-rots have been under close observation in Alberta, very considerable losses have occurred each season. For instance, in 1927, when root-rots were very severe, the reduction in the value of the crop, based on the estimated percentage losses in 1,467 fields of wheat inspected, amounted to approximately $12,000,000. Loss of time, interest on investment and other items would increase this figure.

Information on remedial methods, based upon experience and research to date, can be obtained from the Dominion Laboratories of Plant Pathology. (See circular No. 72.).

OTTAWA: J. O. PATENAUDE, Acting King's Printer, 1933.

[illegible] this time.

[illegible] methods, based upon [illegible] with the Dominion Laboratories of Plant Pathology, [illegible]